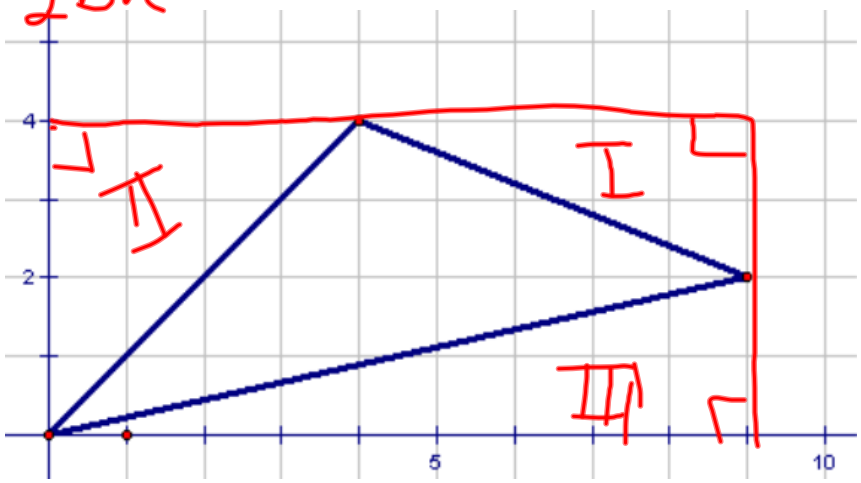
Area by Determinants

$A = \frac{1}{2}bh$



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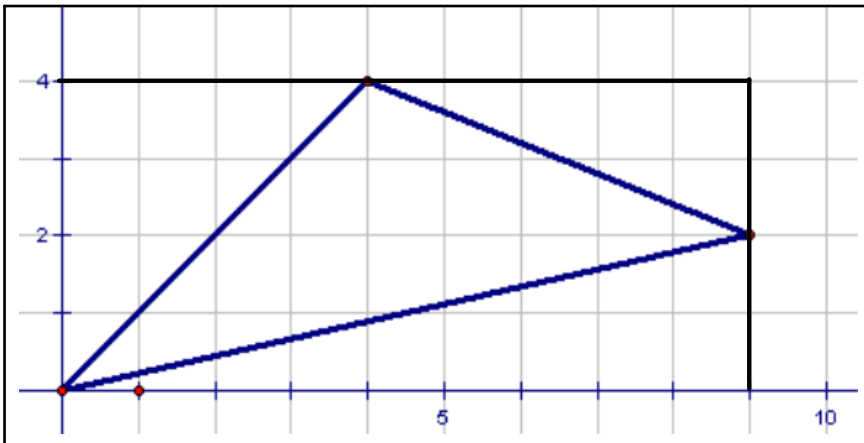

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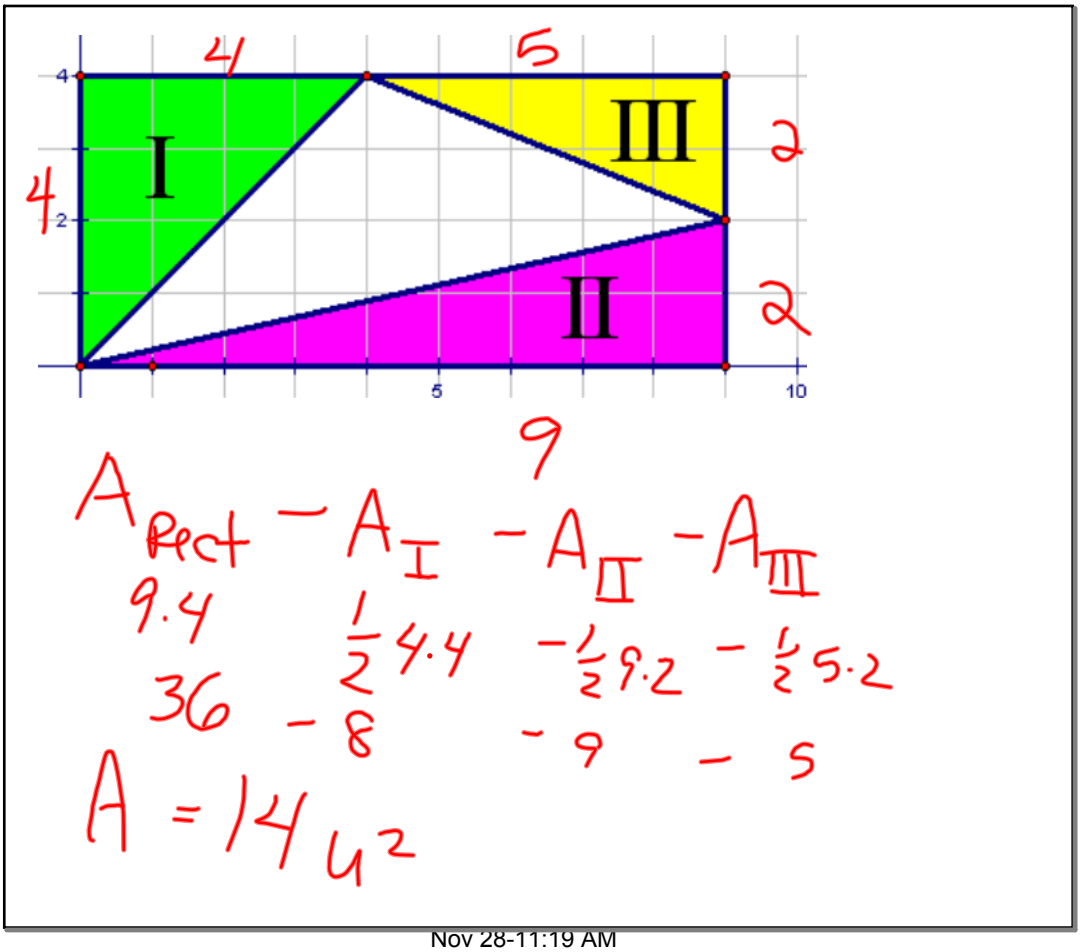

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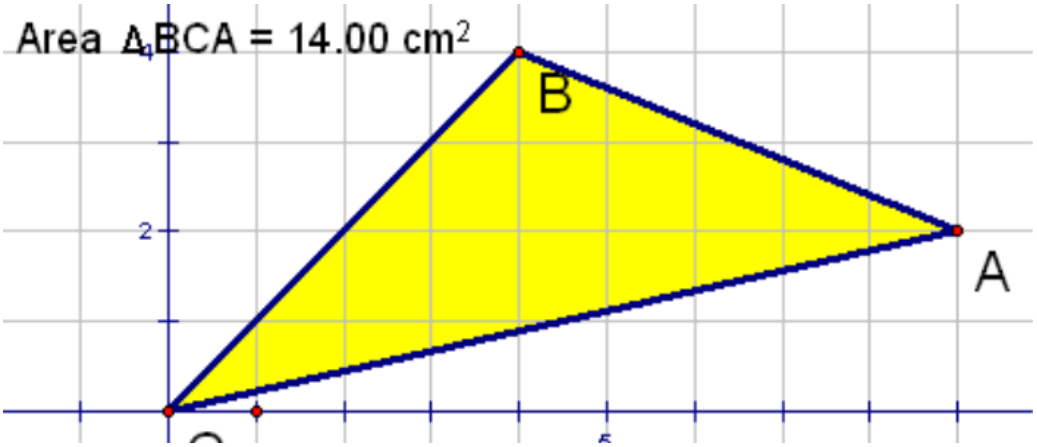

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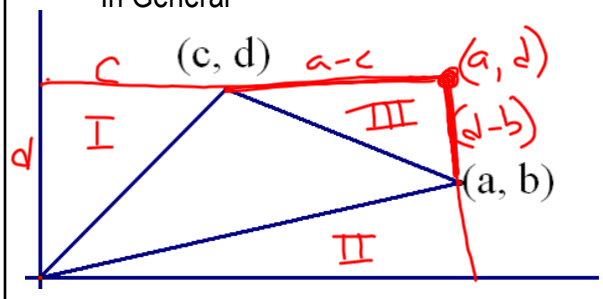
In General



$A_{Rect} - \frac{1}{2}cd - \frac{1}{2}ab - \frac{1}{2}(d-b)(a-c)$

$a \cdot d - \frac{1}{2}cd - \frac{1}{2}ab - \frac{1}{2}[ad - ba + cb - cd]$

$ad - \frac{1}{2}cd - \frac{1}{2}ab - \frac{1}{2}ad + \frac{1}{2}ab - \frac{1}{2}bc + \frac{1}{2}cd$

$\frac{1}{2}ad - \frac{1}{2}bc$

$= \frac{1}{2}(ad - bc)$

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Area by Determinants

w/ (0,0) (a,b) (c,d)

$$A = \frac{1}{2}\begin{vmatrix} a & b \\ c & d \end{vmatrix}$$

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Example:
Find the area
(0, 0), (5, 2) (4, 6)

$A = \frac{1}{2}\begin{vmatrix} 5 & 2 \\ 4 & 6 \end{vmatrix}$

$30 - 8$

$A = 11 \text{ units}^2$

$A = \frac{1}{2}\begin{vmatrix} 4 & 6 \\ 5 & 2 \end{vmatrix}$

-22

$= -11$

$A = 11 u^2$

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Do:
Find the area.
(0, 0), (5, -3) (-10, 9)

$A = \frac{1}{2}\begin{vmatrix} 5 & -3 \\ -10 & 9 \end{vmatrix}$

$45 - 30$

$A = 7.5 u^2$

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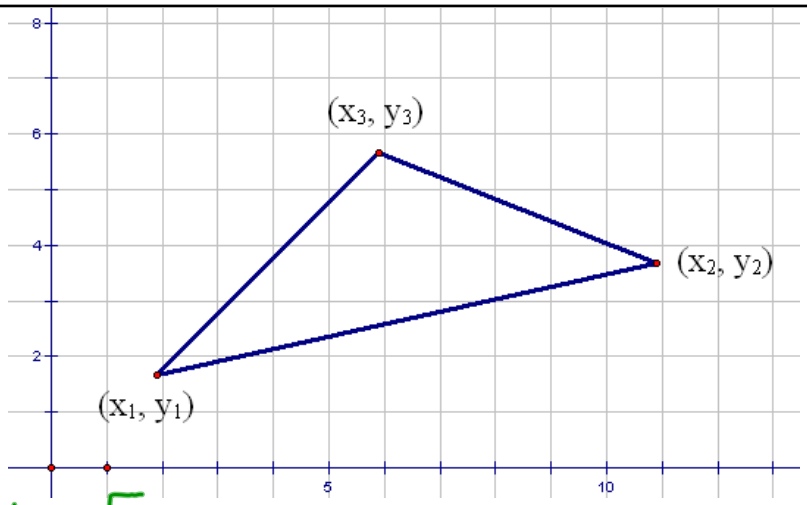
What if...?



$$A = \frac{1}{2}\left[\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix} + \begin{vmatrix} x_2 & y_2 \\ x_3 & y_3 \end{vmatrix} + \begin{vmatrix} x_3 & y_3 \\ x_1 & y_1 \end{vmatrix}\right]$$

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Ex:
Find the area:
(3, 8) (5, 1) (-1,2)

$$A = \frac{1}{2}\left[\begin{vmatrix} 3 & 8 \\ 5 & 1 \end{vmatrix} + \begin{vmatrix} 5 & 1 \\ -1 & 2 \end{vmatrix} + \begin{vmatrix} -1 & 2 \\ 3 & 8 \end{vmatrix}\right]$$

$-37 \qquad 11 \qquad -14$

$A = 20u^2$

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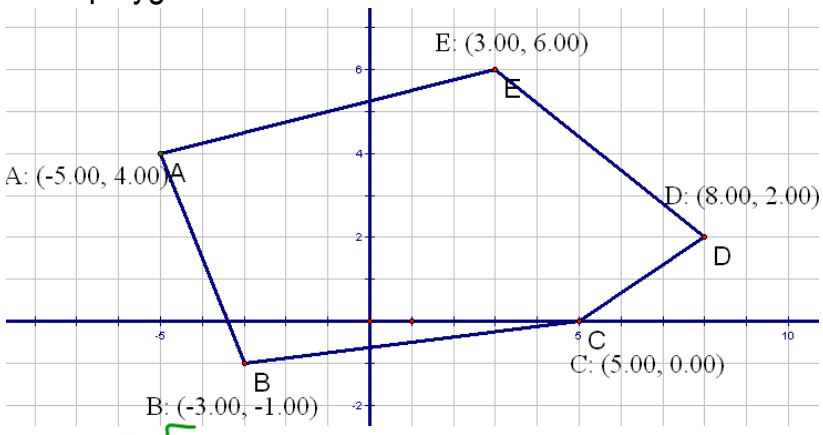
Other polygons



$$A = \frac{1}{2}\left[\begin{vmatrix} -5 & 4 \\ -3 & -1 \end{vmatrix} + \begin{vmatrix} -3 & -1 \\ 5 & 0 \end{vmatrix} + \begin{vmatrix} 5 & 0 \\ 8 & 2 \end{vmatrix} + \begin{vmatrix} 8 & 2 \\ 3 & 6 \end{vmatrix} + \begin{vmatrix} 3 & 6 \\ -5 & 4 \end{vmatrix}\right]$$

$5 + 12$

$17 + 5 + 10 + 42 + 42$

$\frac{1}{2}\,116$

$= 58\text{u}^2$

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